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Changes in the Wild Boar *Sus scrofa* population in Luxembourg during the period 1946 to 1996

by

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Résumé: Cette étude, basée sur les tableaux de chasse établis par l'Administration des Eaux et Forêts, examine le statut du sanglier *Sus scrofa* L. au grand-duché de Luxembourg. Un modèle de distribution spatiale très net fut établi, le nombre de sangliers abattus étant plus grand dans le centre nord et le long de la Moselle. Le nombre total de sangliers abattus a évolué d'une façon exponentielle durant les 30 dernières années, bien que le nombre de permis de chasse soit resté relativement stable. Les causes probables de cette évolution sont discutées.

Abstract: This study investigates the status of the wild boar *Sus scrofa* L. in the Grand Duchy of Luxembourg, using official hunting statistics. The wild boar shows a clear pattern of spatial distribution in Luxembourg, with numbers of animals shot being greatest in the northern-central part and along the river Moselle. Total number of individuals shot has increased exponentially over the past 30 years, whereas the number of hunting permits has remained relatively stable. Possible reasons for the observed increase in population size are discussed.

Keywords: Wild boar, *Sus scrofa*, population, distribution, Luxembourg.

1. Introduction

The population of wild boar *Sus scrofa* L. has increased throughout the species' European range over the past few decades (e. g. Italy: Apollonio et al. 1988, Blasetti et al. 1987; Fennoscandia: Erkinaro et al. 1982; Eurasia: Genov 1981; France: Gérard et al. 1991; Spain: Tellería & Sáez-Royuela 1985; Switzerland: Waka 1977). Since the wild boar is generally extremely difficult to observe, most population estimates have resulted from mark-recapture studies or from the analysis of hunting records (Gérard et al. 1991). In the Grand-Duchy of Luxembourg, the wild boar is also generally thought to be increasing in numbers (e.g. Anonymous 1997); however, no information in the scientific literature is currently available on the

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status and demographic evolution of the wild boar in this country. The objective of the present study was to (a) investigate trends in the wild boar population over time, and (b) determine the distribution of the wild boar in Luxembourg, using data from hunting records.

2. Wild Boar Hunting in Luxembourg

In Luxembourg, hunting is regulated by the Service de la Chasse et de la Pêche (S. C. P.) of the Administration des Eaux et Forêts. Individual hunters have to apply to this department to receive metal marks for red deer *Cervus elaphus* L., roe deer *Capreolus capreolus* L., mouflon *Ovis musimon* Pallas, and wild boar. There are different marks for males and females. These marks must be clipped into the right hind leg of the shot animal before it can be transported, so that hunters can only shoot as many individuals from each species and sex as they have corresponding marks. The S. C. P. gives out different numbers of marks each year according to variations in the estimated population size of the two deer species, whereas hunters can obtain as many marks as they want for mouflon and wild boar.

The hunting year starts 1st August and ends 31st July. Hunting (on all species) is allowed during the day and prohibited from one hour after sunset until one hour before sunrise. Wild boar can be shot all year round, as long as their body weight is below 50 kg when intestines are removed. Above that body weight, male boar can be shot only from 1st June to 31st January, and females from 16th July to 31st January. Beating hunts (max. 35 hunters per hunting area) for wild boar are allowed from 15th October to 28th February, during which dogs can be used to get the wild boar out of hiding places. Additionally, dogs can be used from 1st August to 14th October to hunt boar in maizefields, although the hunters themselves may be placed in adjacent forests. For more details on hunting in Luxembourg, see Ministère de l'Environnement (1997).

3. Methods

The study was based entirely on the official hunting records kept by the Administration des Eaux et Forêts. Since the 1989/90 season, these records have been very detailed. Because the data are collected with great precision and cover the whole country, they should give a good reflection of trends in the population size of this hunted species. Data are classified separately for each of the 607 hunting areas; however, since these areas are too small to yield useful results, the data were analysed with communes as the unit. Each of the 118 communes included on average 5 hunting areas. If an individual hunting area was divided by communal borders, it was assigned to the commune into which the majority of its area fell. Prior to the 1989/90 season, the records were less detailed; consequently, we used only the total number of wild boar shot each year. Numbers of hunting permits were used to relate variations in the wild boar population to possible changes in hunting pressure.

4. Results

The number of hunters issued with permits each year varied little throughout the study period (Fig. 1). In terms of boar number shot, there was a decrease, down to pre-war levels (64-335 boar shot per year from 1900 to 1939, not shown), until the mid-1950s. However, since that time the number of wild boar shot each year has increased exponentially. Especially since the 1989/90 season, this increase has been dramatic. When we corrected for variations in the number of hunting permits per year, the number of wild boar shot per hunting permit showed a highly significant increase in a near exponential way since 1955 (exponential model: r^2=0.860, $F_{1,40}$=246.09, $p<0.001$). The recent dramatic rise in numbers shot has not only occurred in a particular region, but over most of the country (Fig. 2). As regards the spatial distribution of the species, Fig. 3 illustrates the presence of a clear pattern across the country, using the mean number of wild boar shot per km^2 per year over 7 seasons. Overall, more boar are shot in the Northern-central than in the Southern part of the country, the exceptions being the commune of Niederanven and the Moselle region.

Fig. 1. - Number of wild boar shot (continuous line) and number of hunters issued with permits (dotted line) from 1946 to 1996.

5. Discussion

The increase in wild boar shot each year is unlikely to be a result of increased hunting pressure, because the number of hunting permits given out each year has been more or less stable. When corrected for differences in number of hunting permits issued, the increase in number of wild boar shot is still highly significant.

Fig. 2. - Wild boar shot per km^2 during (a) the 1989/90 season and (b) the 1995/96 season. Values represent the number of wild boar shot per km^2. Values in brackets are the number of communes in each category, out of 118.

Fig. 2. (continued)

Fig. 3. - Distribution of the wild boar in Luxembourg. Values are the mean number of wild boar shot per km^2 per year from 1989/90 to 1995/96. Values in brackets are the number of communes in each category, out of 118.

Since numbers of boar shot have increased throughout the country, the overall increase in numbers shot cannot be due to boar increase in only a particular region. For example, in 1989/90, no boar was shot in 27 communes from six cantons, whereas in 1995/96, this number had decreased to 11 communes from four cantons. Thus, the boar increase is clearly a countrywide phenomenon.

Nevertheless, there is a distinct pattern of wild boar distribution in Luxembourg. Overall, more boar are shot in the Northern-central than in the Southern part. The exception in the South is the commune of Niederanven, where a large number of boar are killed annually. This can probably be explained by the fact that Niederanven includes most of the largest forest complex of the country (the "Grengewald"). In addition, more boar are shot per km^2 consistently along the river Moselle than in the rest of the South, which cannot be explained by any obvious factor such as food availability, forest cover or human population density. Why wild boar do not seem to exist in nine South-Western communes (Bascharage, Bertrange, Bettembourg, Dippach, Leudelange, Mondercange, Reckange-sur-Mess, Sanem and Schifflange) is not clear; it may, however, have to do with the motorways surrounding this area to the South, East and North. These may constitute a barrier that slows down or prevents colonisation of the area by wild boar.

The increase in the population of wild boar in Luxembourg may be part of a general increase in boar numbers all over Europe (as described by e.g. Apollonio et al. 1988, Blasetti et al. 1987, Erkinaro et al. 1982, Genov 1981, Gérard et al. 1991, Tellería & Sáez-Royuela 1985), possibly owing to a single cause. Although Sáez-Royuela & Tellería (1986) also review many other possible reasons for the observed increase, they postulate that a potential single cause might be the fact that the Western Palearctic is becoming more temperate. Because wild boar depend mainly on the ground to feed, hard winters with long periods of frost can seriously limit their ability to find food (Sáez-Royuela & Tellería 1986). It would be logical to assume that young offspring will be more affected; consequently, hard winters may act as a factor controlling wild boar populations (Briedermann 1971a). This is consistent with our data: there have only been rather mild winters in Luxembourg since 1986, with only very short periods of frost and snow. Another possible factor in Luxembourg is year-round supplementary feeding, which is being used by many hunters in an attempt to keep the boar permanently in or around their area. As a consequence of this, potential intra-specific competition for food resources is likely to be greatly reduced in many areas, which may allow even weaker individuals to survive. Indeed, Groot Bruinderink & Hazebroek (1994) have shown that in the Netherlands, cessation of supplementary feeding resulted in fluctuations of annual reproductive success, depending on the availability of the major natural wild boar foods, beech and oak mast (e.g. Briedermann 1976, Groot Bruinderink & Hazebroek 1995, Tucak 1996). In Luxembourg, most of the past ten years have been good mast years (although no hard data are available); hence, it may seem that supplementary feeding would not have any positive effect on boar survival. However, it could have such an effect by constituting an easily accessible food resource at times of year when mast availability is low.

A third potential cause of the observed increase in the wild boar population may be that more maize - a favourite food of the wild boar (Waka 1977) - has been planted in the country over the past three decades (Administration des Services Techniques de l'Agriculture 1995: 67). This may have proved to be a large and easily accessible

food source for wild boar all around the country during the summer months, before mast becomes available in autumn. Finally, the wild boar occupies a tremendous diversity of habitats throughout its range (Dardaillon 1987), so the fact that it can survive even in more agricultural areas or areas with a relatively high human population (Gérard & Campan 1988) may also have contributed to the increase.

Thus, we postulate that good availability of the species' natural food resources, oak and beech mast, as well as of less natural foods such as maize, combined with year-round supplementary feeding and the high behavioural plasticity of the species, have contributed to the observed increase in wild boar numbers. However, we suggest that another major factor also plays an important role, namely the fact that boar hunting has become more difficult in the past decade owing to a series of circumstances.

Firstly, hunting success for wild boar is greatly increased by the presence of snow, as this allows hunters to find the animals better and hunt them more effectively (Waka 1977). Because of mild winters (see above), this opportunity was rarely available during the past decade. Secondly, there were very bad storms in Luxembourg between 25.01.90 and 01.03.90 with wind speeds up to 134 km/h, destroying 4944.7 ha (5.7 %) of forest out of a total of 87381 ha. Most of the destroyed areas rapidly developed into very dense shrub, providing excellent hiding places for the boar. Increased availability of hiding places has been seen as a cause of the increase in the populations of several large mammals in Spain (Tellería & Sáez-Royuela 1984). In Luxembourg, most of the yearly harvest of boar is shot at the time of beating hunts; but even during these hunts, beaters are often unable to get the boar out of dense shrub (personal communication from several hunters). Thirdly, despite the ability of wild boar to survive in more agricultural areas or areas with a relatively high human population (see above), human disturbance has also been shown to influence their behaviour (Singer et al. 1981), notably by increasing their nocturnal activity (Stegeman 1938, Briedermann 1971b). Again, this makes successful boar hunting more difficult, since in Luxembourg hunters are only allowed to shoot during the day, from one hour before sunrise to one hour after sunset.

Despite these factors making wild boar hunting more difficult, and despite the fact that the number of hunting permits has remained stable, the number of boar shot each year has increased dramatically, especially over the past decade. Although this may sound contradictory at first, there may be a simple explanation for it: as a result of the favourable factors described above, high reproductive rate of the wild boar (e.g. Briedermann 1971a) has led to actual boar numbers rising at an even higher rate than the number shot.

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